



AIRS Clear Sky Tests Results from Simulations

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AIRS Clear Sky Tests



AIRS Clear Sky Tests *Objectives*



- Hierarchy of clear sky tests have been established to meet different objectives
 - Simplest tests required for first data analyses and calibration at instrument activation
 - Night time comparison of short wave channels with SST
 - Tests required based on AIRS radiances alone (at L1b) before retrievals are performed and independent of microwave data availability
 - **fov_clear_flag** set from threshold tests
 - **ClrFrcVis** set from cloud detection in vis/NIRpixels
 - Tests required with microwave and infrared radiances performed before main retrieval steps
 - Comparison of predicted AIRS radiances based on AMSU channels
 - Final tests based on retrieval process information and results of cloud-clearing
 - **clear_flag** set on test to largest eigenvalue from the first cloud clearing



AIRS Simulation Data

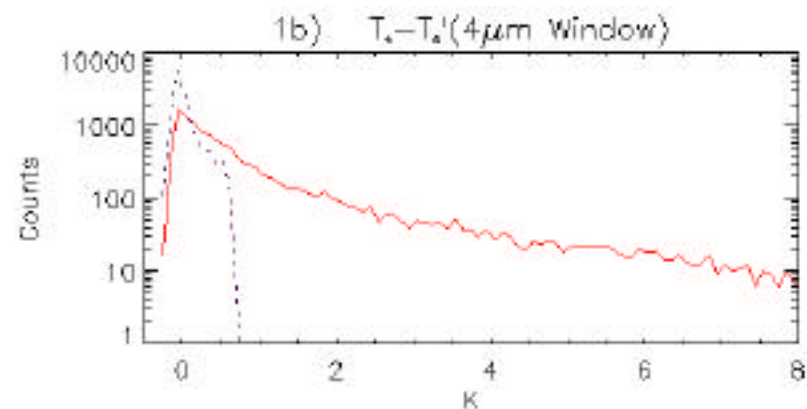
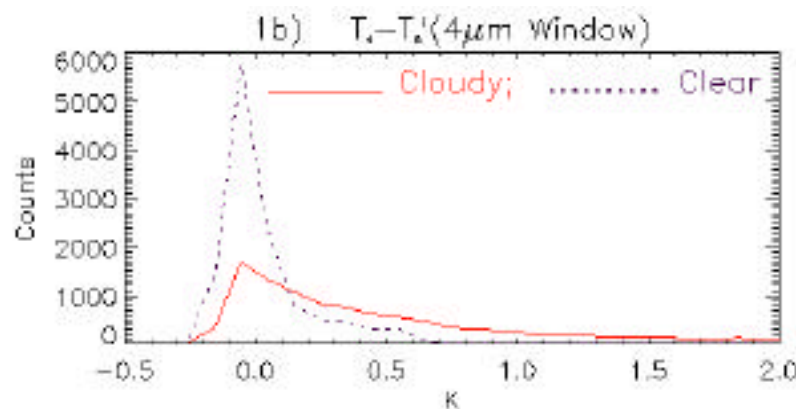


- All proposed clear tests evaluated against AIRS/AMSU/HSB simulated data in July
 - Radiances simulated with and without cloud effects
 - V2_2_0_aa simulation data
 - Based on “AIRS Level 2 Simulations System Description Document” Version 1 with new cloud model which reduced overall cloud cover but decorrelated the cloud fraction between AIRS footprints
 - Problem identified - *NO CLOUDS IN LOWEST LAYER*
 - Results reported in ADFM #531 (Chen & Gunson, 8/10/01)
 - Analysed simulation data for bias estimate and tested thresholds used in various tests



Group 1 - Night Ocean

- Simplest test for clear sky conditions on individual AIRS footprint compares shortwave channel (2616 cm^{-1}) to SST
- Comparison improved by small atmospheric transmission correction and removal of scan angle dependence
- Essential for “crossing the bridge”
- Evaluated the thresholds by comparing performance for simulations without clouds
- Value stored in **clear_flag_4window**

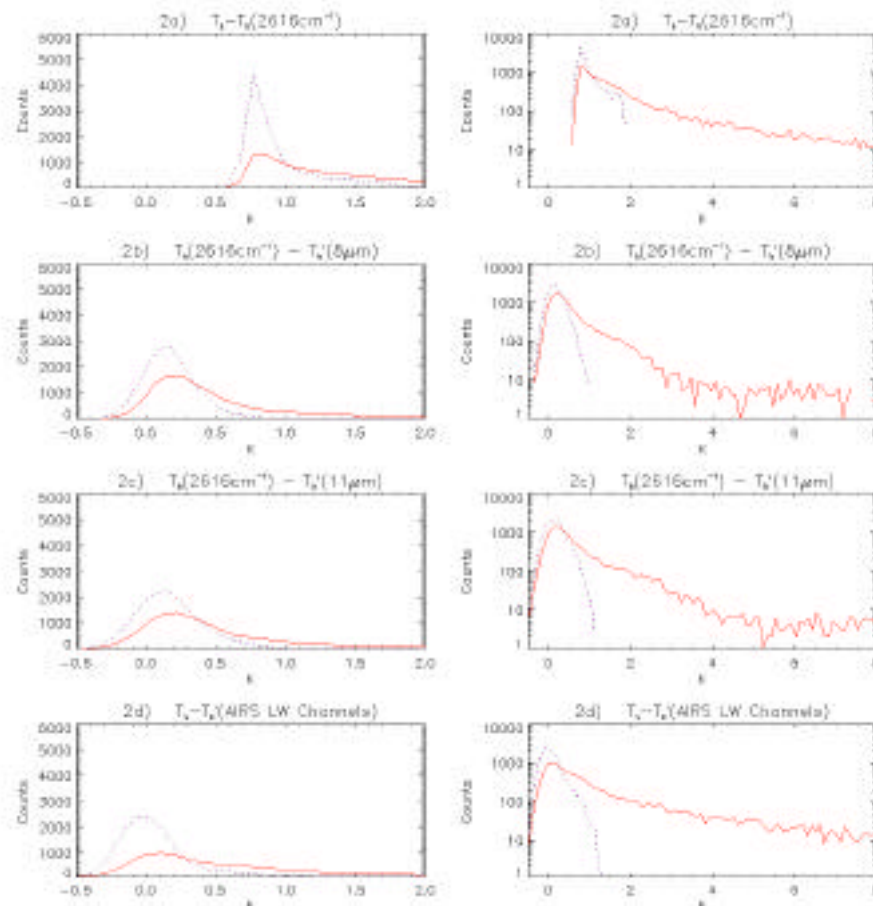


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Group 2 - Night Ocean



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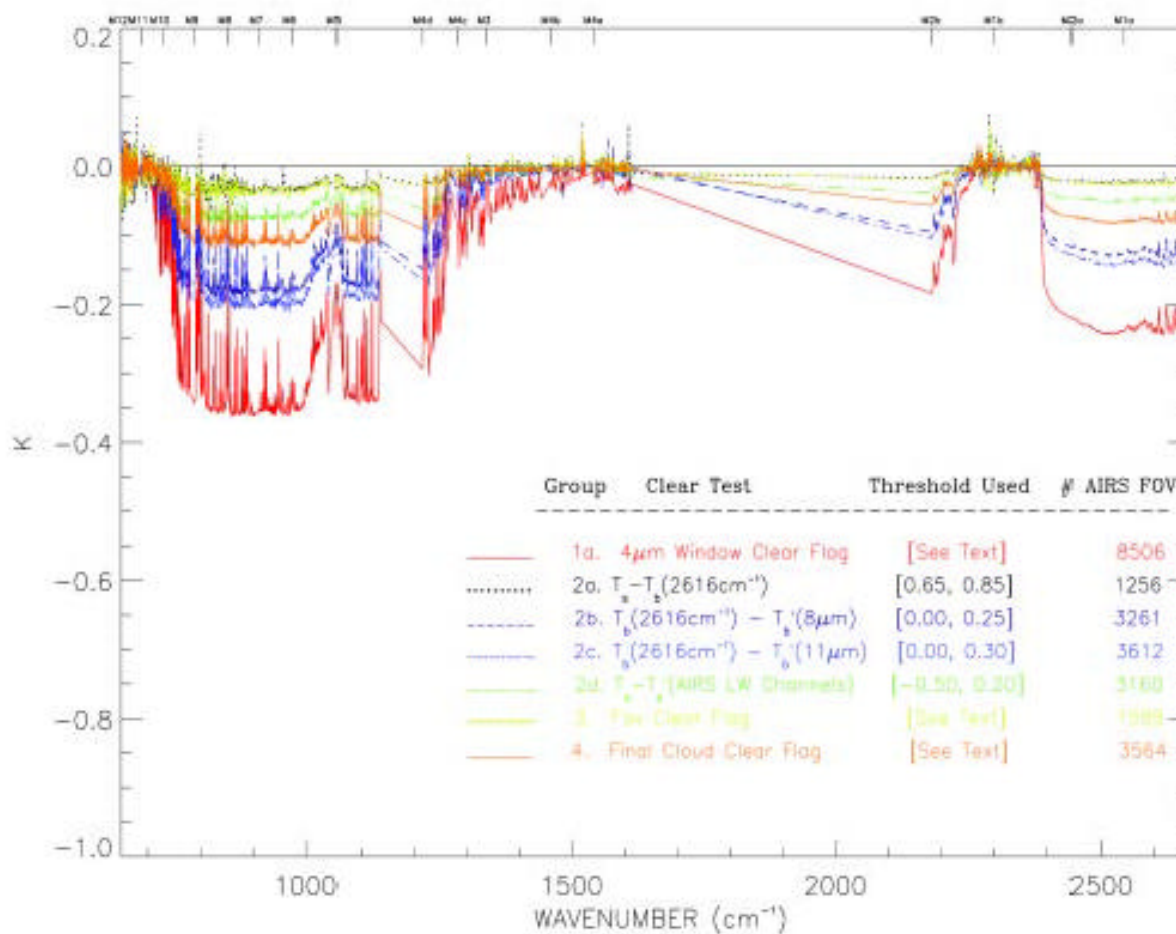
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- Individual tests for the AIRS footprint based on
 - $T_s - T_b(2616)$
 - $T_b(2616) - T_b'(8\mu\text{m})$
 - $T_b(2616) - T_b'(11\mu\text{m})$
 - $T_s - T_s'$ (longwave)
- Individual tests saved in **fov_ocean_cc_test** and used to set **fov_clear_flag** when additional criteria satisfied to eliminate sea ice
 - $T_b > 268\text{ K } (@ 965\text{ cm}^{-1})$
 - $T_s > 271.35\text{ K}$
- Group 3 equiv. **fov_clear_flag**



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Bias - Night Ocean

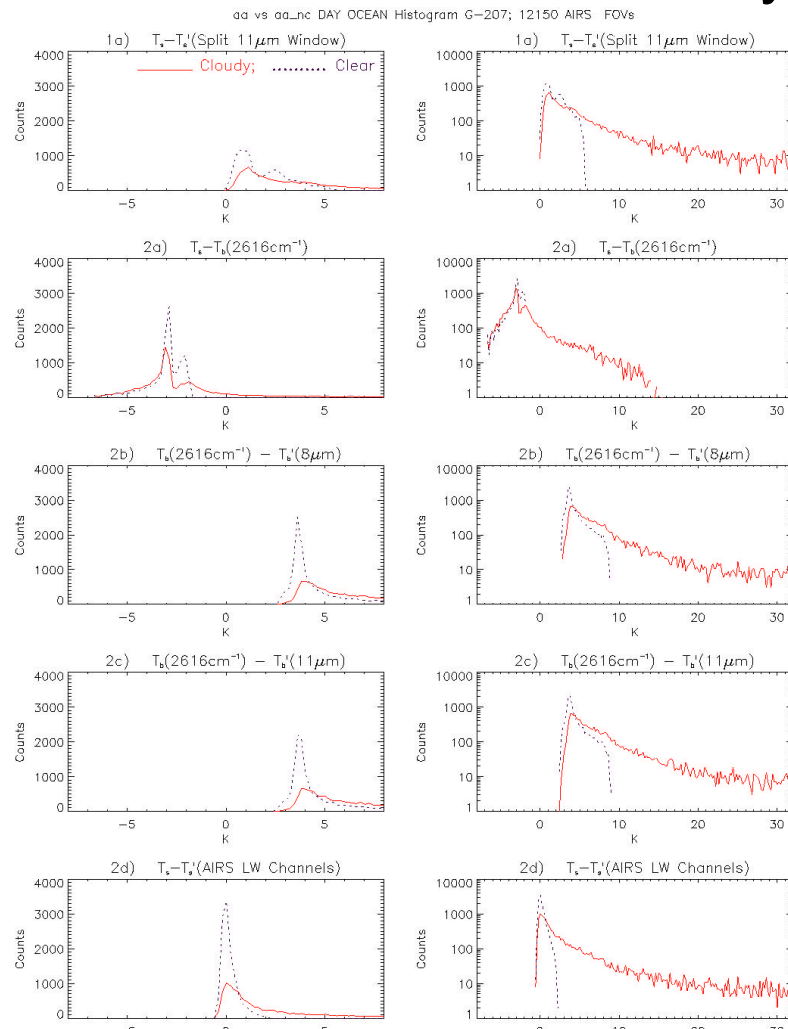


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Day Ocean



- Tests avoid shortwave channels
- Simplest test based on 11 μm split window channels which is much cruder requiring a threshold of 3 K
- All thresholds reevaluated and consequently the yield also changes

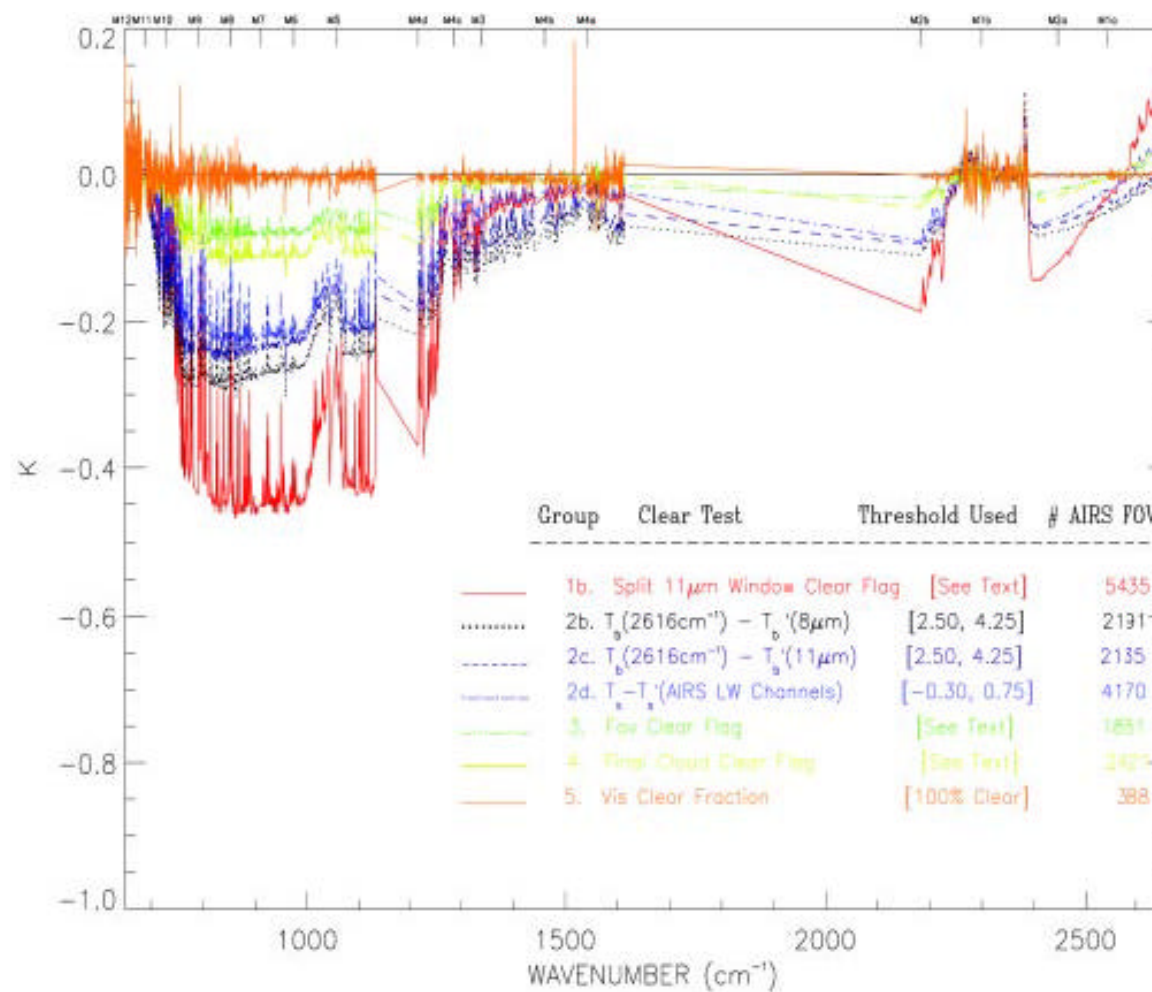
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Bias - Day Ocean

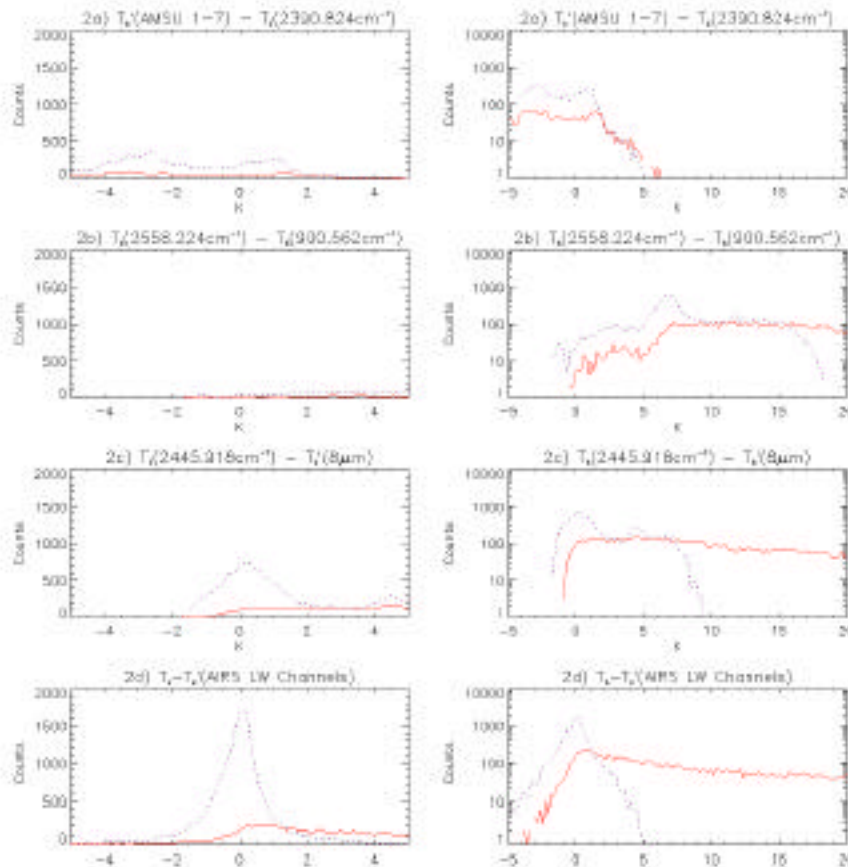


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Group 2 - Land Day

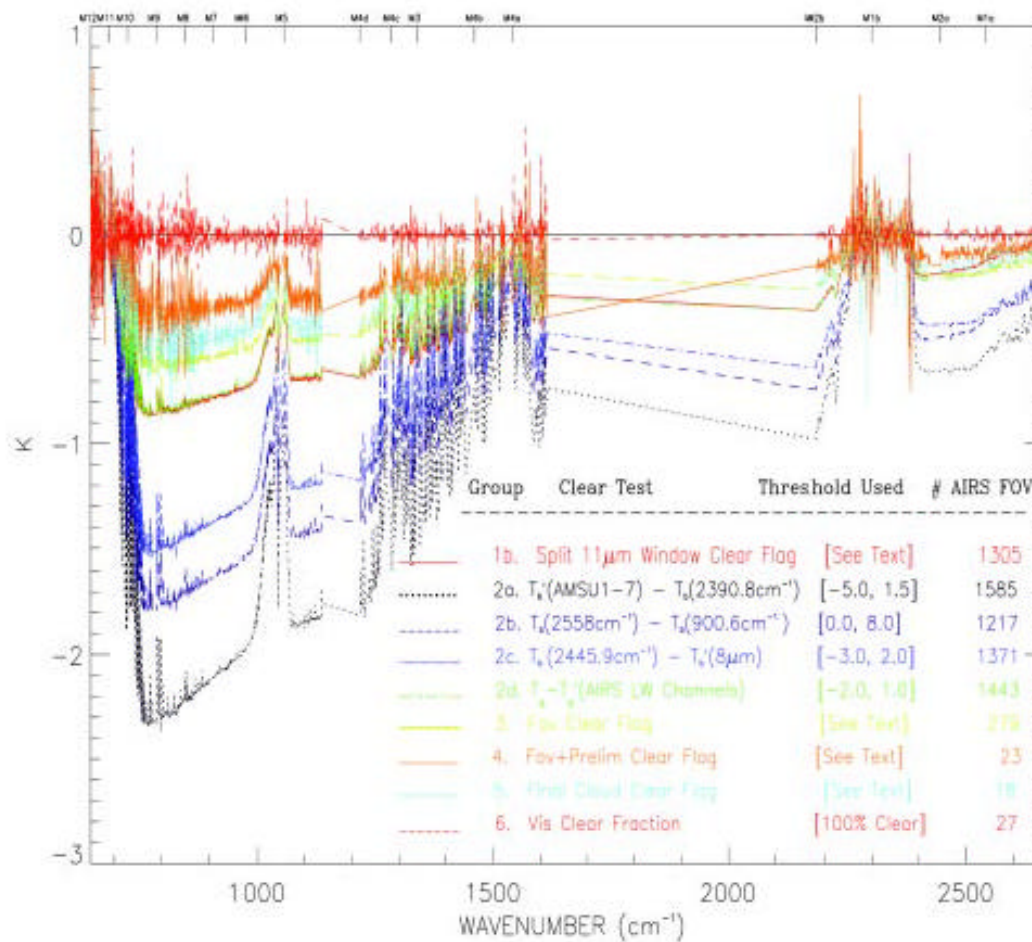


- Uses AMSU channels to predict IR brightness temperatures
 - $T_s'(\text{AMSU(ch. 1-7)}) - T_b(2390\text{ cm}^{-1})$
 - $T_b(2558\text{ cm}^{-1}) - T_b(900\text{ cm}^{-1})$
 - $T_b(2446\text{ cm}^{-1}) - T_b'(8\mu\text{m})$
 - $T_s - T_s'(8\text{ \& } 11\mu\text{m})$
- Values saved in
 - fov_rad_resid
 - fov_swlw_resid
 - fov_psw_fr_lw_resid
 - fov_psst_resid
- Used to set fov_clear_flag
- **Prelim_clear_flag** if 3x3 AIRS fov's satisfy coherence test over AMSU fov satisfies first test with rms < 0.0026



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Bias - Day Land



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Conclusions



- Implemented number of tests and flags in the data processing system (SPS) to suit range of conditions and provide flexible framework for post-launch evaluation
- Simulations are double-edged sword
 - Help to set up framework and test tools
 - Errors and assumptions in simulation can be misleading results in either bias or yield
- New V2_2_2 simulation will be used to reevaluate all cloud detection schemes in coming weeks and cloud-cleared radiances
 - New cloud model with decorrelated cloud fractions and two cloud layers
- Post-launch will roll-out the AIRS system (for calibration and validation) from Night-Ocean > Day-Ocean > Day-Land > Night-Land

Note: new AIRS technical website will be at <http://airsteam.jpl.nasa.gov/>